



Check the pulse

Inaccurate or poorly interpreted diagnostic data costs vehicle operators, dealerships and workshops time and money. Brian Tinham takes advice on the pitfalls and possibilities

Now, perhaps more than ever, it is much too easy for technicians who work on trucks and vans to become over-dependent on their diagnostic tools. However, that is not to say the tools don't work. Far from it: today's systems are, without doubt, the best we've ever had. Indeed, no workshop, large or small, independent or accredited dealership, has been able to do without current instruments since digital electronics took over back when Euro 3 engines – some argue Euro 2 – were introduced in the late 1990s. But the main point is that diagnostic equipment is not, and never will be, a substitute for technician training and good, solid commercial vehicle engineering experience.

That's the view of the vast majority of engineers across the industry. Peter Jones, operations director at independent MAN agent Aquila Trucks, speaks for most when he agrees that workshops must keep their diagnostic tools updated, but adds that there are also issues with over-dependence. "We've come a long way since the days of flash fault codes and repair manuals. For me, they went out with the old

Cummins M11. But now, every time a technician even sees a truck, he plugs a laptop into it, and that can bring the danger of inaccurate or plain wrong diagnosis. As a vehicle repairer, this approach can cost a vast amount of time and money."

Networks of computers

Jones' concern is that technicians need to be fully aware of what the diagnostics might be telling them. He points to the fact that modern trucks are moving networks of computers, covering everything from engine management to ECAS (electronically controlled air suspension), ABS (anti-lock braking system) and EBS (electronic braking system).

"Different ECUs [electronic control units] manage each of those and 'talk' to one another though the CAN interface – which means they all require signals from each other. So you might have a brake fault, but it could also show up as an engine fault on the diagnostics system – because the ECU can't see the signal it's expecting. So you might assume you've got an engine problem and straight away you're going down the wrong track," he says.

Truck diagnostics is increasingly about electronic intervention

That scenario alone proves the point. Yes, of course there are certain ways around such problems: Jones suggests simply clearing down the fault memory, if it's a repetitive problem, before running the vehicle and seeing which then re-occurs first. However, if the fault log shows it's intermittent, well that's not so easy and you may have to do some digging.

Experienced technicians may also have seen other potentially expensive errors. For example, there might appear to be a problem with the gearbox, but, if it's a ZF and you're examining a MAN truck using the Man-cat tool, you're only going to see limited gearbox parameters. Do you want to sanction calling out the ZF agent for a very rare problem? Then, again, if it's a third party's body on the unit, and there are fault codes coming out of your ears, has anyone checked that the other equipment is compatible – or that someone hasn't put a screw through the wiring?

Driver observations

"Get as much information as you can from the driver in the first instance," advises Jones. "Was there a warning light on the dash, for example? What was it doing? If there was, then there will be faults logged on the truck computer. If there wasn't, then the chances are there will be nothing on the computer, too. Most important, though, don't forget basic principles: no matter what the electronics, you're still dealing with an engine, a gearbox, a set of valves, etc, and there may just be a clip off somewhere. The computer isn't going to show you that. And I know that the old days of diagnosing the cause of a misfire have long gone, but sometimes it makes a lot of sense to just take the rocker cover off and have a look before you waste time on the laptop."

That said, everyone agrees that today's systems – both manufacturers' own and those from organisations such as Texa, designed for operators with mixed fleets – are significantly better than those even of just a few short years ago. For a start, the modern equipment is quite flexible, so you don't have to go for a dedicated diagnostic lane. Yes, even ruggedised Panasonic Toughbook screens can break when you drop them, but you can still set your workshop running with a diagnostic bench, so that truck connection is made wirelessly (via Bluetooth or Wi-Fi), if you don't want mechanics to carry the laptop from job to job. Just as important, being able to take the full diagnostics tool in the van has transformed some of the old problems of assessing faults at the roadside.

So, few technicians would like a return to the dark ages of hard back repair manuals or, for that matter, diagnostic computers the size of small wardrobes – or having to drag practically every problematic vehicle off the verge and into the workshop. And the same goes for fleet managers:

Training still the bottom line

Even though virtually all of the manufacturers' and independents' diagnostic tools are far easier to use, and provide much better information straight off the screen, the bottom line remains training. For dealerships, this is meat and drink: mandatory training toward master technician status is an ongoing requirement. For independents, too, training has to be an investment in their future. And then it's a case of 'use it or lose it'. There's no training like experience and practice.

As Tony Shepherd, service manager with DAF, puts it: "Anybody can buy diagnostic equipment, but it's knowing how to use it that counts. And you don't get that by just picking up the laptop once a month. To be effective, there's a heavyweight and ongoing training requirement – which is why we set such high standards for our dealership network."

For him, that starts by teaching technicians about how truck system works – all the way from ECAS (electronically controlled air suspension) to the engine ECUs. "Only then do we show them how to use the equipment. So, when they get a problem, before they even start plugging in the computer, they will be thinking about what might be causing that symptom and what to look at first. Any equipment can give you possible faults, but you've got to understand what it's telling you and where to go with it."

That matters, says Shepherd, precisely because of the complexity of modern systems. "Look at an AS-Tronic gearbox, for example. That system is designed to change gear at precisely the right time and, to do that, interacts with other systems such as the engine brake, when the driver brakes. That means it's seeing signals such as road speed, brakes, the engine and other sensors to make its decisions. So, if a driver tells the technician the engine brake doesn't work, it may not be that. It could be a gearbox situation and the technician needs to know that before he plugs in the diagnostics."

Mark Higham, Iveco product support manager, provides other examples: "A technician could see a message on our EASY diagnostic system that shows a CANbus time-out to a particular ECU, so he might assume there's a problem with that ECU. But is it? It's more likely that there's a simple electrical continuity problem between the ECU and the body computer. On the other hand, diagnostics really comes into its own, if he suspects a fault on, say, a Daily camshaft sensor. Our tool sets itself up as an oscilloscope and lets him compare his trace with the library view, so he can see if there's a problem with the sensor, or just the connector."

"Training and experience are key to preventing engineers from taking diagnostics too literally and that's one of the reasons we set up our DEEC [Dealer Electronic Excellence Community] project – for master technicians to learn from one another."



**Laptop analysis:
first or second
port of call?**

statistics for average time to breakdown repair these days are very impressive, and that is in large part down to vastly improved mobile diagnostics. DAF marketing director Tony Pain, for example, quotes 88 minutes as the average time for roadside repair, from the first call for help, right across Europe on vehicles covered by the DAF Aid package.

That leads to another important point. Yes, technicians need to remind themselves that they can no more blindly follow their diagnostics tool than their Sat Nav, but the opposing fact is that, as trucks get more sophisticated, they are also only going to get more complex. So, in the end, we may just have to adapt our workshop skill sets and accept the need for some dependence on diagnostic aids – because increasingly it's plain unrealistic to expect even the best of the best technicians to unpick what's going on, unassisted.

Workshop evolution

Karl Evans is product quality engineer at Volvo Trucks and he expects that workshop change to happen sooner, rather than later. "Volvo Trucks moved to 100% PC-based diagnostics a couple of years ago and built what we see as an additional dimension. Like others' systems, ours reads error codes and does the functional testing. It also replaces the paper manuals, and provides product information and repair instructions. But now it also provides 'guided diagnostics', designed to steer technicians to the cause of problems."

He describes the system as using 'fault tree analysis' and explains that it moves away from the old problem of technicians being misguided by symptomatic fault codes. "Guided diagnostics reads all the information – including information provided by the driver – and, because it downloads the



precise detail of the product it's analysing, gets straight to the cause," he says.

So let's examine diagnosing an engine brake problem. "Engine brakes, like so many other truck systems, are much more complicated and interactive than they used to be – but also, for different tractor units, the functions might be handled by the braking system ECU, the engine ECU, or a combination. Since the guided diagnostics knows the vehicle, it automatically steers the technician to the right point."

Evans insists he isn't saying that technicians' skills are redundant. "They just need to change. I see a need for three different levels of diagnostics: the fuse/relay level; then the guided diagnostics, handling, say, 70–80% of problems; and then the super diagnostician, with advanced knowledge, for where the system can't trace a fault. As the number of ECUs grows and the potential for fault symptoms grows with it, we just have to accept that it's time to move away from knowledge being mostly in the heads of technicians to knowledge being mostly in the system. The equipment is just too complex to provide all technicians with the training."

For him, this is part of a process of change that's been going on in workshops for years. "When I went through my apprenticeship, we spent a lot of time on the mechanical side – engine and gearbox rebuilds, for example. That doesn't happen these days, because it's just not necessary. Today we expect an engine to notch up a million km and the clutch on an I-Shift transmission, for example, to last 700,000km. So you don't see the kind of rebuild work that went on even 10 years ago."

The point: we may hanker for the old engineering days, but the truth is mechanical components are more reliable, labour costs have gone up to the point where it's a throw-away world and—as manufacturers seek to enhance performance, emissions and uptime – the likelihood is that vehicle problems will be electronic. Technicians and their tools and training need to reflect the times. **TE**

Diagnosics and experience

Nothing is idiot proof and that applies as much to diagnostics tools as anything else. Yes, they're all much easier to use. Yes, they're more flexible, with some even allowing dealerships and independent workshops to load selected others' diagnostic software on their laptops. And yes, they all offer service packs that provide upgrades and additional information on as much of the vehicle on-board electronics as you want. But, no, they're not foolproof.

As Iveco product support manager Mark Higham says: "The computer will only give you feedback on what you asked it – and that may be limited in scope." Hence the tool providers' emphasis on training, training, training.

However, there's another point and that has to do with the pressure technicians feel they're under to clear faults, particularly at the roadside, so that trucks can get rolling again.

"Technicians know they can clear a warning light, using the diagnostic tool, but they should spend the extra 10 minutes it might take to understand it," insists DAF service manager Tony Shepherd. "That's where the skill level, experience and training come in. Maybe the truck was overheating, so the warning light came on – but why? Perhaps it's something simple, such as a lost fan belt. Maybe the oil warning light was on, but, if you can spend the time interrogating the system, you might see that it occurred when the torque and engine revs weren't matched and the driver almost stalled it. In that case, there's not a problem after all."

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